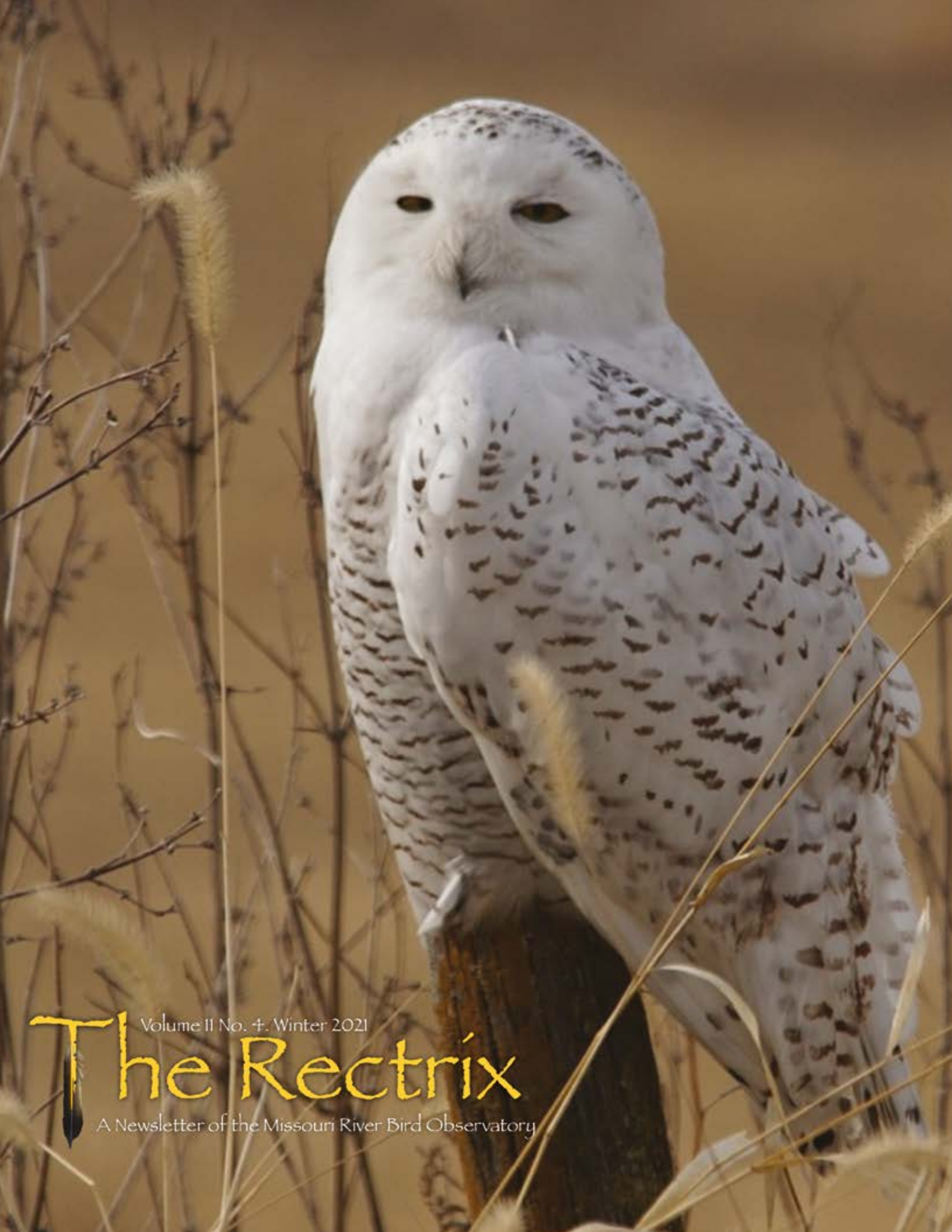


Volume II No. 4. Winter 2021

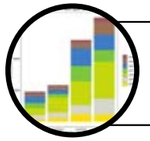
The Rectrix

A Newsletter of the Missouri River Bird Observatory

Our Mission

Conservation

To contribute to the conservation of Missouri's migratory and resident birds through scientific research, community outreach, and education.



Science

To gather information about avian communities and habitat use that will assist state, federal, and private natural resource managers in their efforts to implement conservation programs.

Education & Outreach

To provide opportunities for Missourians of all ages to learn about species and their habitats.

Advocacy

To advocate for sound, science-based conservation policies that benefit birds, other wildlife and environmental quality.

In this Issue of the *Rectrix*

Cover photo: "Elsa the Snow Queen" by Mark Ramsey

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Greetings from MRBO Director Dana Ripper

Holiday Greetings to all!

I hope that by the time you get this newsletter in the mail, we will have more typical temperatures – it is currently a very balmy 72 degrees here in Saline County, MO as I write this on December 15th! The wind is howling out of the south and we have strong storms coming in tonight. I feel that this weather is quite illustrative of the sometimes very tumultuous year that was 2021, and wish for a peaceful New Year for wildlife and people alike.

The Missouri River Bird Observatory has gone through many positive changes over the past year. We are growing as an organization and have ambitious plans for the next few years. The Arrow Rock Nature School is about to become a reality. We are searching for a Nature School Coordinator right now and have a new Education Committee peopled with experienced teachers and education administrators. This is in addition to our ongoing conservation education programs, summer camp, the Missouri Young Birders Club, and more! At this time, we are also looking to hire Operations Assistant position that will assist with administrative duties as MRBO continues to grow.

In the Science realm, we are continuing the grassland bird survey project in Missouri and eastern Kansas with the Missouri Department of Conservation, the Bobolink Foundation, and the Missouri Prairie Foundation, while also hoping to embark on a new survey project in two southern Missouri locations (fingers crossed!). We're finishing up a huge data analysis endeavor with the Conservation Effects Assessment Project (see: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/nra/ceap/) that will cap off eight years of wetland bird data collection.

Finally, we conducted a very small amount of Northern Saw-whet Owl banding this year. Our owl-banding station is really operated for education and outreach purposes, and with the continued pandemic we could not determine a good way to host visitors safely. Therefore we only operated two nights, capturing a total of six owls. As it turned out, the prevalence of south winds during most of the Saw-whet Owl migration period meant that capture rates would have been low anyway, based on our previous experience with this species here in Missouri.

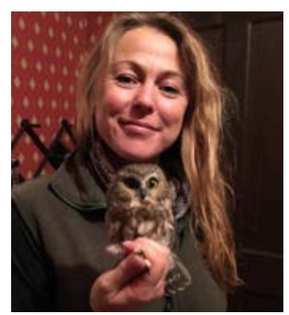
You can read more about MRBO's Science and Education programs in the following pages. Thankfully, in all these endeavors we have a great deal of encouragement and inspiration from MRBO's supporters, partners, funders, and our local community.

During 2021, the MRBO staff has also become more deeply involved in conservation advocacy. Regular readers of this newsletter will be familiar with our commitment to conservation via sustainable agricultural systems, movement away from environmentally unfriendly disposable goods such as single-use plastic, and the reduction of avian window collisions. These are the main areas in which MRBO focuses its advocacy efforts, continually in partnership with other amazing conservation organizations and volunteers. Please check out page 17 to see MRBO's Volunteers of the Year, DeAnn Gregory and Brett Creason. They are an inspiring example of community science transformed into conservation action; their work on the BirdSafeKC project is allowing us to perform science-based advocacy on behalf of birds in the Kansas City metro area.

As always, I encourage everyone to get involved in whatever way you can, whether that be in the form of small personal changes or by developing relationships and partnerships that enable your conservation views to be heard. We must all pay attention to the decisions and policies being made by legislatures and corporations and carefully consider how these affect our wildlife and environmental quality. Everyone can have a positive impact on our communities – both human and ecological! This year, MRBO gave its first Legislator of the Year award, which went to a pro-conservation Representative who happens, fortunately, to be from our local district. Please see more about Rep. Taylor, who sponsored legislation that will help birds and their habitats, on page 16.

In closing, I want to wish everyone a very pleasant holiday season and happy, healthy, birdy 2022. I hope and trust that we will see all of you, friends and supporters, in the New Year!

Sincerely,
Dana



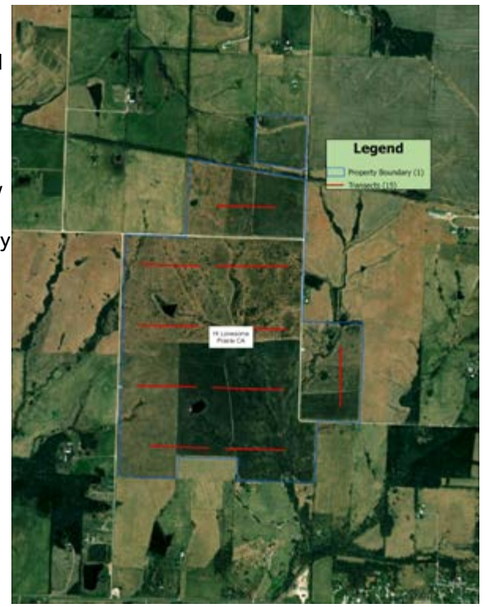
Science

To contribute to the conservation by gathering information about avian communities and habitat use that will assist state, federal, and private natural resource managers in their efforts to implement conservation programs.

The Continued Evolution of MRBO's Science Workflows

Ethan Duke, MRBO Co-founder and IT Department

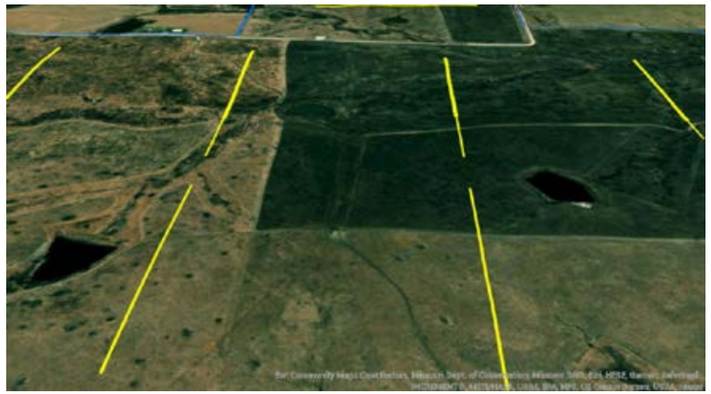
Spending countless hours refining workflows and organizing MRBO's massive, growing datasets doesn't sound very intriguing to many people, but with the continual evolution of science and technology it can be exciting to be on the cutting edge in our niche in the bird world. There is just something about seeing a complex vision come to fruition. The pioneering of technology requires innovation, time, and funding. Fortunately, industry demand in sectors with wealth like fossil fuel, military, and construction have led to more improved and affordable technology that has eventually reached those in the science and non-profit realm.



MRBO stopped using paper datasheets on bird surveys in 2014 and in 2016 began using ESRI's (esri.com) Collector for ArcGIS, now known as Field Maps. Our workflows parallel traditional workflows for bird surveys, but with a few key differences. A typical bird survey project involves study design, data collection, data entry, analysis, and publication of results. Many bird surveys rely on Geographic Information Systems (GIS) to create study designs. We are no different. Whether we do point counts (counting birds at specific, stationary point location over specific time periods) or line-transect (counting birds while walking along transects), we use GIS (see the example of Hi Lonesome Prairie, *right*).

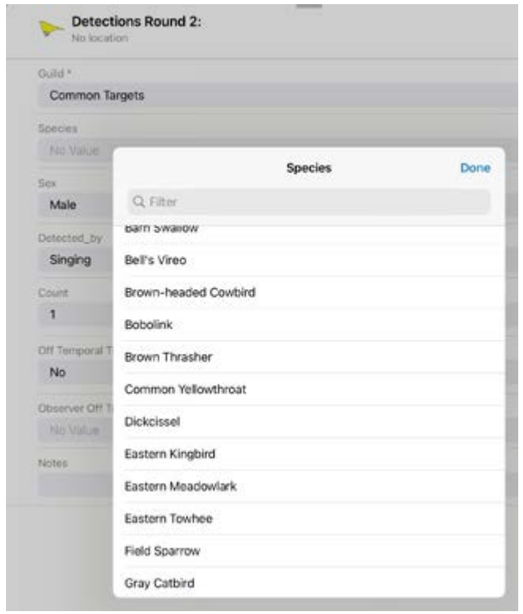
Data Collection and Entry

We first depart from the norm in data collection by using mobile devices with ArcGIS Field Maps to collect data. Observers walk transects by following a map with aerial imagery (screenshot lower left); when a bird is observed, the observer clicks the birds' location on the map and a data form comes up. The form includes dropdown menus for quick and accurate data entry (screenshot next page, upper right). Traditional paper data entry systems necessitate estimates of bird distances from the transects. With mobile data collection, birds are placed where they are seen on the landscape and data entry is as simple and efficient as clicking on a button. The data can then be combined with all observers' data from all years in a cloud-based database in our ArcGIS Online (AGOL) portal with a click of the button. This is a huge departure from traditional data collection and entry. It affords very accurate documentation of bird locations, avoids transcription errors, and saves hours of data entry by many technicians.



Previous Data Processing and Analysis Workflow

Many researchers throughout the world use similar Distance sampling techniques and analyze resulting data using a desktop application called Distance (an example of a Distance model comparison spreadsheet is pictured below). Data needs to be prepared in a specific format for importing in the program Distance. Since our data is georeferenced, I have done this on a PC using ArcMap to edit the data downloaded from our AGOL portal before exporting to in Distance format. We have been using this workflow since 2014 and our dataset has become so large that it takes many hours to import the formatted data into Distance.



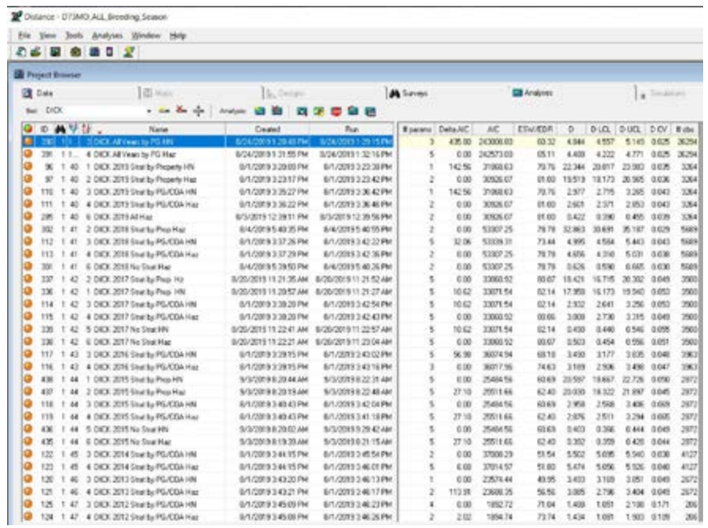
New Data Processing and Analysis Workflow

With help of MRBO's data analyst, Jelisa Oliveras, we are now performing Distance analyses in the R statistical package "mrds"within the powerful statistics program Rstudio. Instead of using ArcMap and exporting files for analysis, we are accessing the data directly from our ArcGIS Online Portal with ArcGIS Pro and running analysis on those features using R-ArcGIS Bridge to combine the statistical capabilities of the R language with the spatial science of ArcGIS. This is even more efficient than our previous workflow, and once again reduces potential error.

Data Management and Sharing

We have used our AGOL portal to serve up raw data and analysis results for our stakeholders and partners since 2016. Previously, we would conduct all of our data processing and analysis locally and then export the results to our AGOL. We are now completely reconstructing how we do this so that all data for particular projects (e.g., grassland breeding season, grassland fall migration, wetlands spring migration and breeding season etc.) are held in one feature service and products for partners are then created as subsets of that feature service depending on need. For example, we have all Missouri grassland breeding season results formatted for Distance analysis in one AGOL feature service. The Missouri Prairie Foundation, for example, may only wish to see results from properties they own and we can create a variety of products based on their specific subset.

One the most exciting aspects of this evolving technology and workflow is the potential applications of new resources in the GIS realm. For instance, this year we wanted to compare bird-use of areas that were burned and rested in the Flint Hills of Kansas. It can be very difficult to map exactly where areas were burned on large landscapes, but thanks to the European Space Agency's Sentenil-2 satellite imagery we were able to identify burned areas using infrared bands. Just imagine the potential future understandings we will be able to achieve using other remotely sensed habitat or ecological data in tandem with our unique, spatially-explicit bird data! Future updates to the datasets such as additional survey data, covariate data (e.g., patch-burn grazing, other management, or habitat variables) will now take place on the same feature services, streamlining our workflow to eliminate the process of creating new datasets each year.



I hope you are as enthusiastic as we are! Science is so cool!

How does using statistical code help with bird conservation?

Jelisa Renee Oliveras, MRBO Data Analyst

Statistical code in any form can be intimidating at first. Coding is another world of language, but when practiced, you will see a connection between coding and conservation. Who would think a high-tech statistics program such as R can help so much? Like anything else, there are steps to follow, similar to identifying specific bird species. It seems like a stretch, right? For any birder, advanced or freshly out in the field, there will be steps to follow or, in this case, specific characateristics to look for, such as the color, shape, patterns, and vocals of a particular bird. In code, there will be similar patterns of characteristics that can help us identify and achieve outcomes.

Here we will focus on the Dickcissel. Dickcissel is a species of conservation concern, despite their status as a relative habitat generalist within grasslands. The Dickcissel is found in several different regions in Missouri; however, there is always a limit to the number of individuals any particular habitat patch can support. This is where we can use R to find out!

Why do we use statistical code?			
	Statistical code can analyze hundreds of thousands of species at a time. R has reusable functions that describe how to use them and give examples. (User-friendly for anyone on any level)	For simplicity's sake, we will select the package called Distance. Distance sampling in R can estimate the size or density of biological populations. (Sounds helpful for conservation so far)	Distance is crucial for creating abundance and density estimates in challenging and realistic situations in the field. (Perfect in helping with endangered bird species or any species for that matter!)

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Let's break down how to code. Remember there are steps to follow and you can view the screenshot below to follow along. First, we need to load the distance package into R – library (Distance). Then we use the **ds() function** to fit bird detections in on a particular study site and calculate the density estimates (imagine doing this by hand with hundreds of Dickcissel observations). Inside the **ds () function**, we see **data = Home**: containing Dickcissel distance numbers and habitat variables – for example, burned vs. unburned, native vs. reconstructed prairie, or warm season vs. cool season grasses. In our code, **key = "hn"**: half normal default model, and **adjustment = NULL** indicates no adjustments are used. **convert.unit** = type of units used in the study (such as meters for distance to bird, and acres for the size of the study site). **truncation = 100** means that we're looking at birds within 100 meters. Finally, we input the object name **Dickcissel.Habitat** into the summary (Dickcissel.Habitat) produces the density estimates in R.

```
# Load the Distance package in R
library(Distance)

# We use the ds() from the Distance package
Dickcissel.Habitat <- ds(data = Home, key="hn", adjustment=NULL,
                         convert.units=conversion.factor,
                         truncation = 100)

# Summary will produce density estimates
summary(Dickcissel.Habitat)
```

That's it! You are a coder now. Several other examples like this in R can help with conservation. We can discover the habitats in which Dickcissel densities are highest and help inform private landowners, biologists, or organizations in their restoration of native habitat. The density estimates can help us track how Dickcissels, or any species, are doing in the habitat over time. Do you see now how well coding and avian conservation go together? Yes, there will be challenges along the way, but if you stick to it, we all can help the world in some way, even with code!

2021 Fall Migration Project: Results, Trends, and Interesting Observations

Erik Ost, MRBO Field Project Leader

MRBO's sixth consecutive season monitoring fall migration at Wah'Kon-Tah Prairie and Linscomb Wildlife Area concluded this November. For those not familiar with the project, MRBO has been conducting repeat line-transect surveys on Wah'Kon-Tah and Linscomb (St. Clair/Cedar County) during fall migration to monitor bird occupancy and phenology. Each season, beginning in early September and ending mid-November, I and a technician walk line-transects and record every bird detected by sight and sound. It takes seven to eight mornings to cover all the transects at each site. The same area gets surveyed on a weekly basis, averaging nine total rounds of surveys each season. Slight modifications to the study design have occurred over the seasons but overall the methodology has remained consistent. The most notable exception was in 2018 when we had three surveyors instead of two and that year, Monegaw Prairie was included in the study. Starting in 2020, a new tract, now part of Wah'Kon-Tah, was added to the study design. Starting this fall, a new addition to Linscomb was surveyed as well.

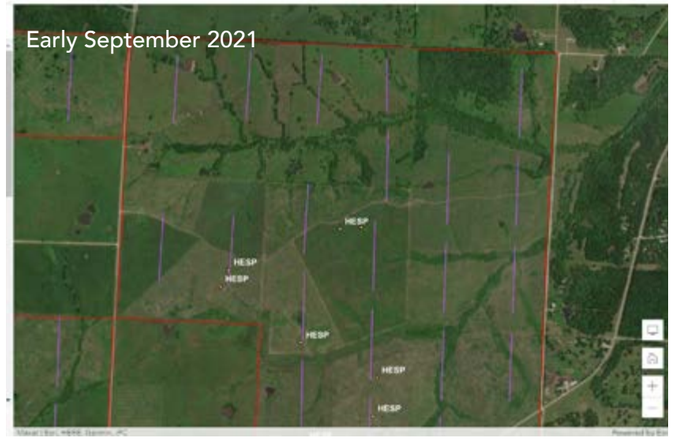
2021 fall surveys yielded almost 43,000 bird detections of 177 species, bringing our total number over the six seasons to just over 201,000 birds of 205 species! Around 18,000 of the detections this fall were classified as flyovers, which are not included in further analysis since birds simply flying over the area are not using the grassland habitat. The bulk of these flyover species were Red-winged Blackbirds, American Robins, Greater White-fronted Geese, and European Starlings. The remaining ~25,000 birds were using the habitat in which we were surveying! We'll be discussing these detections more thoroughly.

The most numerous species detected was American Goldfinch (2,502). This has been the case every year as they are easily the most detectable species; they actively fly around in flocks and contrary to most of the other birds that are in the grassland, when you spook them, they take flight while others take cover (e.g., sparrows)! Unique to this fall, there is a clear tier of species that were detected more frequently. After goldfinches, the species with the most detections were Swamp Sparrow (1,346), Field Sparrow (1,264), Common Yellowthroat (1,229), Blue Jay (1,044), Indigo Bunting (1,033), Red-winged Blackbird (1,007), and Song Sparrow (1,006).

Looking at these species, you might be wondering how Blue Jays are one of the most detected species when considering we are conducting surveys in grassland habitat! These numbers do not reflect a critical component of our surveys, which is spatial attribution. Our surveys allow for interpretation at the spatial level because every detection we make is marked on a handheld device (such as a smartphone or tablet) with an aerial basemap, allowing us to know exactly where in the landscape that bird was detected. (Ethan's article on pages 4 and 5 explains this in detail). While we are surveying in a grassland habitat, the landscape is quite heterogenous and looking at a map of Wah'Kon-Tah or Linscomb, this becomes clear. These grasslands have riparian draws, woodland patches, upland and low-lying prairie, wetland pools, glades, and brushy, edge-habitat. This might bring more clarity to how we have been able to detect over 200 species while on-survey over the years!

Including this spatial component allows MRBO and land managers at these sites to understand how alterations to specific areas will affect bird occupancy. The map to the left is a snapshot of a portion of Wah'Kon-Tah with Blue Jay detections from the fifth round of surveys (mid-October

2021). You can see that Blue Jays are detected in the wooded/brushy riparian areas and hardly any are detected in open prairie habitat. If those wooded/brushy areas are cleared, it would be reasonable to expect that Blue Jays would not be present in the same numbers at the described locations.



Let's explore the data from a grassland-obligate species. The maps to the left are the same area; the top map shows detections from the first round of surveys (early September 2021) and shows only Henslow's Sparrow detections. Comparing this to the Blue Jay map, you can see that these species use drastically different habitats and are distributed quite differently as well. Blue Jays are scattered more evenly across appropriate habitat while Henslow's Sparrows are clustered and more restricted in their occupancy. If the land manager at Wah'Kon-Tah wants to manage for post-breeding and migrating Henslow's Sparrows, they can use this spatial information to plan accordingly. If a prescribed burn was scheduled for one of the tallgrass prairie units that these Henslow's Sparrows were detected in, these sparrows would be displaced. Instead, burning one of these tracts in early-October might be better as Henslow's Sparrows are far less abundant in the area, as shown in the bottom-left map with data from the end of September 2021.

Fall surveys in 2021 provided enlightening results. Looking at all species combined, occupancy in the grassland was higher than normal. This fall, ~25,000 individual birds were observed using the study areas. In previous seasons, the average has been closer to 19,000. Some of the species that were detected in higher-than-average numbers are Bell's Vireo, Common Yellowthroat, Eastern Towhee, *Empidonax* flycatchers, Field Sparrow, Gray Catbird, House Wren, Indigo Bunting, Lincoln's Sparrow, Swamp Sparrow, and Yellow-breasted Chat. If you are familiar with these species' habitat preferences, you'll notice that most of them are brushy/edge habitat preferring species. In other words, they like the transitional state between grassland and early-successional woodland.

Comparing averages over the years, not many species saw declines in detections. The most notable declines include Carolina Wren, Eastern Bluebird, Eastern Meadowlark, and Henslow's Sparrow. The declines in Carolina Wrens and Eastern Bluebirds were expected considering how significantly effected these species are by extreme cold over the winter; Missouri had a spell of severely low temperatures in February 2021. Based on our data from this year, Carolina Wrens were impacted much more drastically than Bluebirds. For the past 5 years, Carolina Wrens were detected an average of 234 times during the entire season. In 2021, Carolina Wrens were only detected 23 times! Eastern Bluebird detections were more variable. In fact, MRBO detected a more significant difference in Bluebird numbers between 2018 and 2019 than from 2020 and 2021.

In other species, the changes in numbers we observe are probably related to habitat management. In previous years, more acreage on our study sites had significant structural changes due to prescribed burns, clearing draws by bulldozing, and brush hogging/mowing. When areas receive this type of management, it translates to the brushy, tall, and thick vegetation getting converted to short-grass and/or bare ground for the remainder of the fall season. This management is necessary to prevent woody encroachment and the transition to brushy and wooded habitats and the timing of management applications is key to the presence and/or abundance of some species. This fall, both study areas had very little structural change. Brushy, riparian thicket and draws remained intact the entirety of the season in all but one area and only a couple areas received burns during our monitoring timeframe. These areas were hotspots for all aforementioned species that saw increases, except for Swamp Sparrow.

This photos shows three management actions - an area burned this fall (right), a mowed buffer-strip (center) and adjacent, currently undisturbed, tallgrass prairie (left).

Two species that exhibited extreme increases in detection rates include Least Flycatcher and Lincoln's Sparrow. This year, Least Flycatcher detections increased about 300% and Lincoln's Sparrow detections increased by almost 200% compared to our seasonal averages! On the flip side, the lack of management may be partly responsible for the declines in Eastern Meadowlark and Henslow's Sparrow detections. Meadowlarks are one of the few species that always respond positively to structural disturbances like burning and mowing. Henslow's Sparrows need large areas of contiguous grassland with minimal woody and shrubby vegetation. However, our survey results this year show that other species with similar needs to those of Henslow's Sparrow, such as Sedge Wren and LeConte's Sparrow, were not impacted negatively. This suggests that habitat structure alone may not explain the low number of Henslow's Sparrow detections.

Other interesting observations made during this fall season include the increased presence of American Woodocks. Typically, they are only found on fall surveys in one area at Wah'Kon-Tah, a fragmented woodlot with a brushy understory. This fall, there were significantly more present, mostly in late October and early November. They were vocalizing their "peent" call and twittering about around one of the burned areas early in the morning. American Woodcocks are known to winter in Missouri during warmer winters and we certainly have had a warm fall and winter thus far. We also observed a higher-than-normal number of Rose-breasted Grosbeaks. In the month of September, this species was a common detection while in past years they were quite scarce. Grosbeaks could sometimes be detected in a riparian draw using young willows or other small trees.

Check out MRBO's YouTube channel for videos recorded in the field. Many of them were recorded during the 2021 fall migration season!

The fall migration project is truly unique for the state of Missouri and is helping bring clarity on post-breeding and migrating bird occupancy and phenology in a variety of grassland-type habitats. This remarkably productive year will be interesting to compare with 2022 to examine the results of management strategies. We will continue to investigate management connections and phenological aspects of our bird data in our yearly report to the Missouri Department of Conservation; this is published in February and will be available at https://mrbo.org/mrboreports/.

Guest Article: Hedwig in Missouri

Mary Nemecek, Burroughs Audubon Society Conservation Chair & MRBO Supporter

If Snowy Owls weren't already one of the most adored, magical species on the planet, J.K. Rowland cemented that title with the Harry Potter series. What's not to like - big, deep yellow eyes, an adorable, round head with a perfectly small beak covered by feathers and very fuzzy feet. They were made to capture the hearts of the world and that is exactly what happens every time they show up in Missouri. This winter looks to be a big year in Snowy Owl sightings for both Missouri and Kansas.

These sightings have many people asking, why do Snowy Owls come this far south? The answer to this may not be what you expect. For decades the myth persisted they were starving and here to look for food. To understand why this is not the case it's important to understand their diet during breeding season on the arctic tundra.

Snowy Owls consume primarily lemmings during the breeding season, and lots of them! Studies show 90-99% of their diet during the breeding season is made up of lemmings. Lemming populations fluctuate but about every four years there is a boom in lemming numbers. Snowy owls will congregate during breeding seasons to nest in areas with abundant prey; this provides more food to feed nestlings. Their clutch size is one the largest in birds of prey with a mean of seven eggs per nest, and up to a maximum of 11 eggs! Snowy Owls cache (store) food at their nesting sites. Studies of cached food during most breeding seasons show 10-15 individual prey items, but during years with high lemming populations that number can grow significantly, with one nest's food cache holding 83 lemmings in Barrow, AK! During lemming boom years, the more food, the more nestlings survive, the more juvenile Snowy Owls fledge. Years with abundant lemming populations fuel Snowy Owl irruptions where the owls move in large numbers away from their regular wintering areas. The last large irruption for North America was 2017-2018, four years ago.

A new research movement, Project Snowstorm, was born out of the epic irruption year of 2013-2014. Researchers began attaching solar powered transmitters on Snowy Owls to monitor their movements. The transmitters use cell phone towers to transmit information and can store up to 12 years' worth of data. In the arctic, the solar batteries can become low, but during the winter, when the owls move south into cell tower range, the sun will recharge the battery sending all the saved data on the owl's movements during the summer when they were out of range. Many of these owls will return following winters and share their travels with scientists via their downloads. This project has greatly increased our knowledge and understanding of Snowy Owls.

Researchers assess the body condition of the owl prior to placing a transmitter. Any owl not in good health does not receive a backpack. The ability to determine the health of Snowy Owls outside their normal winter range has shown most owls that move south are in good health. In irruption years, over 80% are juveniles (less than 12 months of age). The body condition of juveniles is generally lower than that of adults. This is not unexpected as juveniles will decrease in mass after fledging to form stronger bones and muscle and then add on fat later. The body condition has been shown to improve over the winter for juvenile birds in both regular and irregular (areas south of normal winter grounds) wintering areas. While the gain was greater in the regular winter areas, juvenile birds in irregular wintering grounds still gained on average 29.3- 30.8 g/month.

This has changed how we think about Snowy Owl irruptions. Most Snowy Owls are not starving, but rather, here because of a bumper breeding season and their nomadic nature. As the data shows with birds that return in following years, they successfully make the journey back north, survive the breeding season and then make it back south again.

Snowy Owls taken to rehab or found deceased are often emaciated. Juvenile birds early in the season will have lower body condition due to the loss of mass after fledging. They are also likely to be less dominate and lose out on available food to more aggressive, adult birds before they leave. These are the ones more likely to get into trouble. Project Snowstorm has studied over 300 deceased owls and found those in poor condition often had underlying disease or illness. During the large irruption of 2011-2012 there were a minimum of 224 reports in Missouri and Kansas. Out of 24 salvaged owls, it was reported all but 3 were emaciated. With any species, mortality in young birds is high. Project Snowstorm cites vehicle collisions, rodent poison, and electrocution on power lines as three common causes of mortality.

During the winter, Snowy Owls expand their diet to include small mammals, waterfowl, and other birds. We now know Snowy Owls will take waterfowl over water, often at night. Pellets from Snowy Owls at Smithville Lake (Clay County, MO) during the 2011-2012 irruption contained American Coot and Ring-billed Gull. During winter irruptions Snowy Owls will seek out areas with ample food resources and in some cases congregate in those areas. In previous years Smithville Lake, just north of Kansas City has hosted several owls at one time.

As we head into the depths of winter, Snowy Owls sightings around the area are likely to increase. It is important to remember to keep your distance. While Snowy Owls appear awake during the day, data shows they are primarily nocturnal and will hunt more at night. They do not move much during the day- unless disturbed. Getting too close to a Snowy Owl can cause it to fly into traffic or be mobbed by another raptor or crows. Do not ever feed a Snowy Owl in the wild.

Reporting Snowy Owl sightings in eBird (www.eBird.org) helps scientists track their presence. Photos, taken at a safe distance, are very helpful and can be uploaded to your list. For more information on Snowy Owls go to www.projectsnowstorm.org

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Project Snowstorm data, accessed at www.projectsnowstorm.org

Education

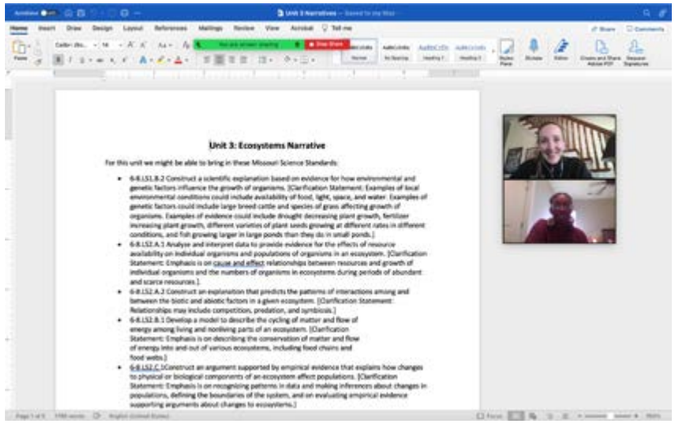
To contribute to conservation by providing opportunities for Missourians of all ages to spend more time outdoors and to learn about species and habitat conservation.

It's Not Just the Product, It's Also the Process

Paige Witek, MRBO Education Coordinator

Since early October, MRBO's Virtual Nature School Assistant Developer, Brittney Cade, and I have been working hard on the Virtual Nature School (VNS) project. VNS offers standards-based lessons tied specifically to Missouri ecosystems, built to be used in both in-person and virtual classroom settings. For this newsletter, I wanted to share with you not only a little more about the project as it nears completion, but also the process of development behind it.

This fall, Brittney and I have been working on the Grades 6-8 resources which consist of various lessons organized into units. These are built around the Missouri Learning Standards and use Missouri-specific examples for place-based learning. Each lesson consists of an introductory video, a relevant activity that can be done in the classroom or individually at home, additional video(s) or other resources to expand upon the lesson theme, and assessment materials. Recently, we have been working on "Unit 3: Ecosystems." In this unit students will explore how all species within an ecosystem are connected and the actions of one can affect the survival of others. When developing ideas for this unit we wanted to make sure students understand how scientists, land managers, individuals, and communities can use scientific thinking to conserve birds and their habitats. We envisioned them learning about natural ecosystem function, how to manage habitats to achieve these ecosystem functions, and how they, the students, can make a positive difference. Ok, great! We have our concepts, but how do we put these ideas into practice so the students can understand?



Unit 3: Ecosystems Narrative

For this unit we might be able to bring in these Missouri Science Standards:

- 6-8.LS1.B.2 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]
- 6-8.LS2.A.1 Analyze and interpret data to provide evidence for the effects of resource availability on individual organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]
- 6-8.LS2.A.2 Construct an explanation that predicts the patterns of interactions among and between the biotic and abiotic factors in a given ecosystem. [Clarification Statement: Relationships may include competition, predation, and symbiosis.]
- 6-8.LS2.B.1 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, including food chains and food webs.]
- 6-8.LS2.C.1 Construct an argument supported by empirical evidence that explains how changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making inferences about changes in populations, defining the boundaries of the system, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

The first four lessons in "Unit 3: Ecosystems" center around one species, the King Rail. We chose this species as it is unique, interesting, and is also a species listed in the Missouri Bird Conservation Plan. First, the students learn all they can about the species in "Lesson 1: Who is the King Rail?" In lesson two, the students explore the concept of habitat requirements by mapping out what they think the ideal habitat for the King Rail would look like. This transitions into habitat management for "Lesson 3: How Can We Help the King Rail?" where the students examine their schoolyard as a habitat and how it might be improved. For lesson four, the students examine an example of conservation and the human-environment relationship in learning about bird-friendly, shade-grown coffee farms in Central America and how this connects to Missouri. The unit culminates into "Lesson 5: YOU are Conservation."

In this lesson the students do their own research on the species of their choice in the Missouri Bird Conservation Plan to learn how they can help protect that species. The students will do their own research, make a story about their species to convey their findings to the class, and develop a plan of action on what they and their classmates can do for conservation. We are hopeful that by empowering the students to take their own action, we can instill a lifelong conservation ethic.

The process for developing these ideas and materials involves a lot of brainstorming, working out the details, and re-brainstorming. Coming up with ideas and concepts for the lessons is the easy part. Writing up the instructions so they not only make sense to us and contain the right material, but also making sure they will be clear to the students and teachers who will use them, is the tricky part. It requires a unique attention to detail and knowledge about how these lessons will work in practice. It has been an interesting and challenging process to transform activity instructions written for educators into activity instructions for students to follow. We are transforming them from the general to the specific.

Another challenging aspect of the project has been trouble-shooting the video writing, filming, and editing process. However, it has also been quite enjoyable to use our creative skills to educate in a new way. Brittney and I may have felt a little awkward at first talking to a phone camera about ecosystem services, but ultimately it was fun work. We love to get a little animated. You can check out the videos that have been completed so far by visiting the MRBO website or our YouTube channel. The video editing magic on these videos was done by MRBO's very own Ethan Duke!

The Virtual Nature School project grew out of the desire to provide Missouri teachers, administrators, and students with resources to help adapt learning during the COVID-19 pandemic, but since that conception, it has grown into so much more. We believe the project provides great potential for students to learn about Missouri's birds, their habitats, and other Missouri flora and fauna in new, meaningful ways. If you find yourself with some spare moments, you can check out the resources for yourself at mrbo.org/virtualnatureschool/.

Did You Know?
King Rail Research

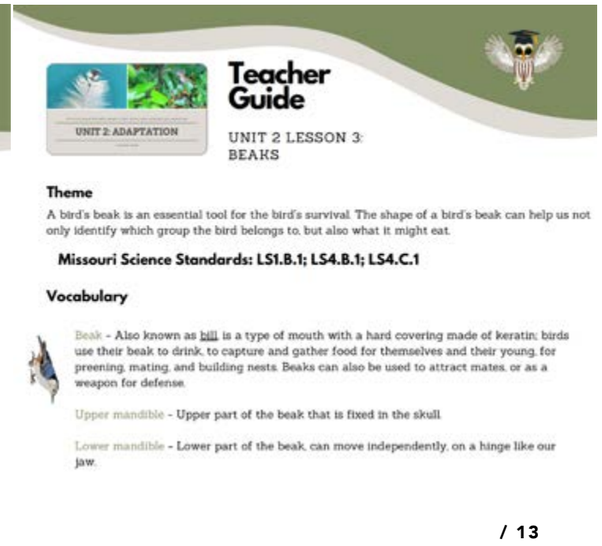
STUDENT ACTIVITY INSTRUCTIONS

Materials Needed:

- Notebook
- A pencil or pen
- Google Scholar - https://scholar.google.com/
- Links: https://www.youtube.com/watch?v=XnR20-MPvsI and https://www.youtube.com/watch?v=pmno-Yfetd8
- After watching the above links: 1 Primary Source and 3 Secondary Sources
- Reliable Source Checklist Worksheet

Introduction (Read before doing the activity)

In this activity, you will discover all that you can on the King Rail and its habitat requirements. In addition to learning the life history of the King Rail, you will also learn about the reliability of information sources.



UNIT 2: ADAPTATION

Teacher Guide

UNIT 2 LESSON 3:
BEAKS

Theme

A bird's beak is an essential tool for the bird's survival. The shape of a bird's beak can help us not only identify which group the bird belongs to, but also what it might eat.

Missouri Science Standards: LS1.B.1; LS4.B.1; LS4.C.1

Vocabulary

Beak - Also known as bill, is a type of mouth with a hard covering made of keratin; birds use their beak to drink, to capture and gather food for themselves and their young, for preening, mating, and building nests. Beaks can also be used to attract mates, or as a weapon for defense.

Upper mandible - Upper part of the beak that is fixed in the skull.

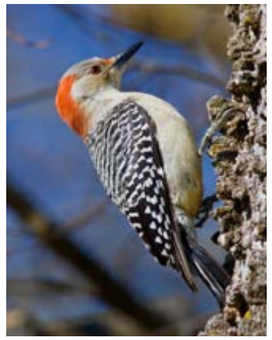
Lower mandible - Lower part of the beak, can move independently, on a hinge like our jaw.

Winter is for Woodpeckers!

Paige Witek, MRBO Education Coordinator

Winter is a great time to get more familiar with your Missouri woodpecker species! With the Yellow-bellied Sapsucker now here for the winter, you will be able to see all seven species we have here in Missouri! Woodpeckers are a unique and fascinating group of birds as they can do what very few other creatures can… repeatedly strike wood with their beak to create cavities. Woodpeckers have a variety of unique adaptations that allow them to do this: a spongy skull, chisel-like beak, zygodactyl feet, tripod tail feathers, an especially long tongue, and many other features. You can learn more about all of these adaptations by viewing a YouTube video provided by the Daniel Boone Regional Library of a presentation MRBO gave recently on Missouri's Woodpeckers. Just go to YouTube and search, "Daniel Boone Regional Library woodpeckers" and it should be at the top of the list.

Let's learn about the woodpecker species here in Missouri!

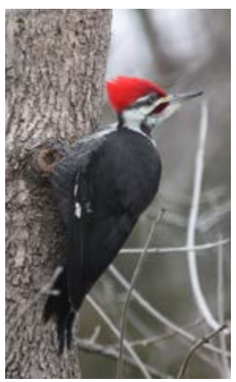


Red-bellied Woodpecker

The Red-bellied Woodpecker is one of the most common species you can find at your backyard suet feeders. They have a black and white checkered back, white belly (with just a little wash of red…), a light greyish face, and red nape. The red nape on the male Red-bellied Woodpecker extends all the way around the top of the head to the beak. On the female, Red- bellied Woodpecker, this red nape only goes to the back of the head about to the top of the eye. These woodpeckers like to announce their presence with their loud "*chuck chuck chuck*" calls or their shrill, rolling "*churr*" trill. With either call, it kind of sounds like they are laughing at you.

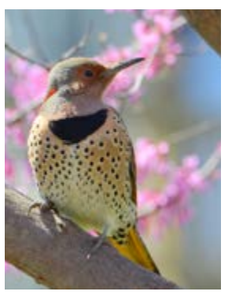
Red-headed Woodpecker

Obviously, this woodpecker has a bright, crimson head with black and white wings, a black back, and a white belly. You can find them in more open woodland type habitats with very tall trees and very little understory. You can also find them along forest edges. Red-headed Woodpeckers make all kinds of loud, harsh-sounding calls. Their most common call is probably their shrill, hoarse *tchur* call, similar to the Red-bellied Woodpecker's but higher-pitched and less rolling.



Pileated Woodpecker

The Pileated Woodpecker is largest of the woodpeckers in Missouri. It's nearly the size of a crow, black with bold white stripes down the neck and a flaming-red crest. Males and females can be distinguished by the presence of a red "mustache" mark extending from the corner of the beak on the male Pileated Woodpecker. These woodpeckers are usually quite shy, so you may hear them more often than you will see them. They typically make a high, clear, series of piping calls that lasts several seconds. The sound is similar to a Northern Flicker's rattling call, although it tends to be more resonant and less even in tone.



Northern Flicker

The Northern Flicker is one of our more unique woodpeckers in both appearance and behavior. They are overall a light brown with a spotted chest and a black necklace patch. When they fly you'll see a flash of color in the wings – yellow if you're in the East or Midwest (such as here in Missouri), or red if you're in the West. You'll also see a bright white patch on the rump. When walking through a field, don't be surprised if you scare one up from the ground. It's not where you'd expect to find a woodpecker, but flickers eat mainly ants and beetles, digging for them with their slightly curved bill.

Downy Woodpecker

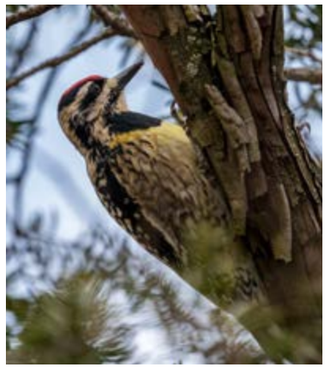
The Downy Woodpecker is the smallest of the woodpeckers in Missouri. Their small size allows them to access food that other woodpeckers are too big to access. You may find one hammering at goldenrod galls to extract the fly larvae inside. They have a white belly with black and white speckled wings and back. Males can be distinguished from females by the presence of a small red patch on the back of the head. You may notice they look quite a lot like the Hairy Woodpecker. Downy Woodpeckers are slightly smaller in size and have dark spots on the outer tail feathers. However, the best way to distinguish them is by beak length. The Downy Woodpecker's beak is only about half the length of its head. Another great way to distinguish between the two is by sound. The Downy Woodpecker gives a descending trill and a much squeakier sounding call.

Hairy Woodpecker

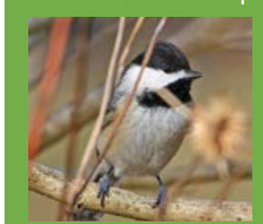
Hairy Woodpeckers are very similar to Downy Woodpeckers. They are slightly larger and a bit shyer, but the Hairy Woodpecker's beak is about the same length as its head, making it longer than the Downy. They also have a crisper sounding call and an even trill. Learning to tell the difference between these two species of woodpecker can be quite the challenge, but also be rewarding!

Yellow-bellied Sapsucker

Last, but not least, the Yellow-bellied Sapsucker! This species can only be found here in Missouri in the late fall, winter, and early spring. Overall, they have a similar pattern to the Downy and Hairy Woodpeckers, but a more "rough" looking appearance. They also have a slight yellow wash and a red cap. Males can be distinguished from females by their red throat; female Yellow-bellied Sapsuckers have a white throat. Even if you don't see the Yellow-bellied Sapsucker, you may find evidence of one! The Yellow-bellied Sapsucker makes two kinds of holes in trees to harvest sap. Round holes extend deep in the tree and are not enlarged. The sapsucker inserts its bill into the hole to probe for sap. Rectangular holes are shallower, and must be maintained continually for the sap to flow. The sapsucker licks the sap from these holes, and eats the cambium of the tree too. New holes usually are made in a line with old holes, or in a new line above the old.



Here are a few of the species that use tree cavities exacavated by woodpeckers.



Carolina Chickadee

Eastern Bluebird

Tufted Titmouse

White-breasted Nuthatch

Advocacy

To contribute to conservation by advocating for sound, science-based conservation policy that benefits birds, other wildlife and environmental quality.

MRBO announces its first Legislator of the Year Award!

As featured in the Marshall Democrat News and Boonville Daily News

The Missouri River Bird Observatory (MRBO.org) has announced the creation of an award to recognize the service of Missouri lawmakers who support legislation benefiting Missouri's birds and their habitats.

The first honoree of this award is Representative Timothy Taylor (R-Bunceton). Representative Taylor sponsored HB369, the "Prescribed Burning Act," which defines liability as it relates to the use of prescribed fire. Before this legislation, Missouri was one of only five states that did not have such a definition in state statute. This will allow landowners and contractors to purchase liability insurance for conducting prescribed burns and increase the use of prescribed fire as a land management tool.

Rep. Timothy Taylor observes as Governor Mike Parson signs HB369.
Photo: The Office of the Missouri Governor

HB 369 also creates harsher penalties for the release of feral hogs in Missouri. Repeat offenders can now be charged with a felony for each feral swine that is released. Feral hogs are highly destructive to wildlife habitat and agricultural production alike. The increased penalties will help further reduce the number of feral swine on Missouri's landscapes.

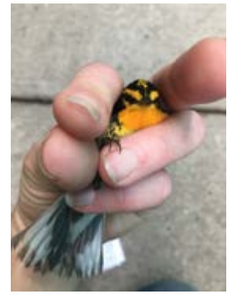
As leaders of a non-profit organization that has been dedicated to conservation for over a decade, MRBO directors and co-founders Ethan Duke and Dana Ripper issued a combined statement, "We are very thankful for all the work put into passing this legislation and wish to thank Representative Taylor, as well as all of our partners in the conservation community, for getting this across the finish line! This legislation will benefit Missouri's bird habitats and people alike."

Former State Senator David Pearce, Chairman of MRBO's Advocacy Committee, has noted "it is fitting for Representative Taylor to receive this honor based on his non-partisan support of legislation that benefits Missouri's private landowners and our shared wildlife resources."

Also included in the final HB369 are several measures that will protect landowners from liability for injuries incurred by recreational users. This benefits landowners adjacent to recreational public lands, campground owners, and those who invite third parties to provide wildlife management services on their property.

Data-driven advocacy to reduce avian window collisions

While photos of bird carcasses are entered in to iNaturalist individually, sometimes surveyors take composite photos of all the carcasses they find on one survey morning, such as this one by DeAnn Gregory.



This Blackburnian Warbler was found stunned at the KC Star building. The bird made an apparent recovery and was released in a natural area away from structures

MRBO and its volunteers continue to document and report on hundreds of avian window collisions in the Kansas City metro area. BirdSafeKC surveyors documented over 200 bird carcasses in Fall 2021, mostly on the Downtown routes. Over the past few months we have made much progress in establishing new partnerships with entities such as the Kansas City Environmental Management Commission and Evergy's Green Team. We anticipate that over the winter we will be able to help several buildings install collision mitigation products on their most strike-prone windows.

Everyone can help reduce bird collisions at their own home or workplace. Even if only a few birds strike your windows each year, consider this multiplied across the millions of residential and commercial structures across the country. If you work in a low- or high-rise building, consider initiating your own survey project. We've often found that employees at BirdSafeKC survey sites are aware of the problem and want to help by reporting bird carcasses that they observe. If you find particular windows that are consistently the cause of collisions, you can talk to your employer about low-cost solutions. MRBO and BirdSafeKC staff and volunteers would be happy to help.

MRBO's Volunteers of the Year 2021

DeAnn Gregory and Brett Creason
for their hundreds of hours of time dedicated to the BirdSafeKC project

Upcoming Events - MRBO & Partners

December 31st - Last chance to enter this year's photo contest mrbo.org/photocontest2021

January 1st – First Day Hike at Arrow Rock State Historic Site
Join Paige and Erik for a New Year's Day hike. We will bird around the town of Arrow Rock, including the Big Spring, Pierre a la Fleché Trail, and parts of the campground trail and River Landing Trail, for about 1.5 miles. Physical exertion will be moderate with some steep inclines and declines. We will end back at the visitor center around 11 a.m. Experienced and beginner birders welcome!

January 15th – Helping Birds – it's easier than you think! Part 3
Join the Missouri River Bird Observatory and the Burroughs Audubon Society to take a deep dive into the Seven Simple Actions to Help Birds! On January 15th, we will be at the Lakeside Nature Center which is an incredible place to enjoy learning about local native wildlife, including birds of prey, snakes, amphibians, turtles, fish, and invertebrates. In the morning (9-11 am) we will go birding and have a discussion about how you can make your windows bird-friendly and why keeping cats indoors (or building a "catio") can help both birds and cats. Then in the afternoon (11 – 2 pm) Lakeside will be hosting a variety of programs and booths to celebrate urban birds and meet one of their avian ambassadors!

January 20th and 22nd – Women's Winter Birding Workshop
Ladies! Are you interested in learning more about how to identify birds and going birding? This is the event for you! Wander Woman, Missouri PFQF and the Missouri River Bird Observatory are teaming up to offer Women on the Wing: Women's Winter Birding Workshop. This is a HYBRID event that will take place in TWO parts: (1) virtually in a Zoom webinar on January 20th from 6-7:30pm and (2) in-person for an in the field birding session at Prairie Fork Conservation Area on January 22nd from 8-10am.

February 12th - Helping Birds – it's easier than you think! Part 4
At this event, we are celebrating the successes of conservation in Missouri and elsewhere! Join us at Burroughs Audubon Library in Blue Springs for a bonfire, bird-friendly coffee, chili with bird-friendly beef, some great conservation conversation, and of course, birding!

Missouri Prairie Foundation
January 5th – Webinar: Ozark Glade Ecology and Restoration Methods
January 19th – Webinar:Woodland & Forest Health for Landowners
Check out https://moprairie.org/events/category/webinar/

Stream Teams United
January 29th – Stream Advocacy Workshop. 1 to 4 p.m. at the University of Missouri Campus or virtually by Zoom.
Registration coming soon at https://www.streamteamsunited.org/events.html
March 8th – Clean Water Day at the Missouri Capitol – outdoors or in the 3rd floor rotunda.
See photos from the 2021 event at https://www.streamteamsunited.org/clean-water-day.html

Missouri Rural Crisis Center
February 15th – Sustainable Agriculture Lobby Day at the Missouri Capitol.
Stay informed about MRCC events at https://morural.org

Missouri River Relief
Returning in **January** – the Big Muddy Speaker Series.
See the monthly programs available in three River towns and online: https://www.big-muddyspeakers.org

See details about all MRBO events and register at: https://mrbo.org/events/

Thank you for your Support

The following individuals and organizations have provided support since the publication of our Fall 2021 newsletter. We give thanks to them and to all who have supported the Missouri River Bird Observatory! YOU make our work possible.

Krystal Anton & Steve Huey
Stephanie Armstrong
Margie Bauer
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Doug & Barb Doughty
Bill & Carol Edson
Lee Elliott
Vernon Elsberry
Theresa & Mark Enderle
Dennis Figg
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Page 6 - "Dickcissel on a Barbed Wire Fence" by Marvin De Jong
Page 7 - Lincoln's Sparrow by Erik Ost
Pages 10-11 background - Snowy Owl by Mark Ramsey
Page 11 - "It's Almost Like Home" - Snowy Owl by Tony Harris

Pages 14-15 - Red-bellied Woodpecker by Emma Watts, Red-headed Woodpecker by Carol Weston, Pileated Woodpecker by Tammy Simmons, Northern Flicker by Tom Tucker, Downy Woodpecker by Chuong Doan, Hairy Woodpecker by Patricia Bouchard on Unsplash, Downy and Hairy Woodpeckers on feeder by Luke Schobert on Unsplash, Yellow-bellied Sapsucker by Peter Lloyd on Unsplash. Carolina Chickadee by Marvin De Jong, Eastern Bluebird by Betsy Garrett, Tufted Titmouse by Amy Watts, White-breasted Nuthatch by Amy Petersen.

Back Cover - "Wren by the Water" - Carolina Wren by Amy Watts

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